

EXECUTIVE SUMMARY

Modeling TDM Effectiveness:

Developing a TDM Effectiveness Estimation Methodology (TEEM) and Case Studies for the SR 520 Corridor

Part of the
Implementing Corridor TDM Programs in the Puget Sound Region Project

Prepared for
Washington State Department of Transportation
In cooperation with U.S. Department of Transportation –
Federal Transit Administration

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April 2003



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Project Purpose

The purpose of this project is to produce an analytical tool that can quantify the effectiveness of TDM and land use strategies and to apply the tool in a variety of case study areas along the SR 520 corridor.

Project Background

State Route (SR) 520 is one of the main state highways in the Central Puget Sound Region of Washington state and serves as a vital link across Lake Washington, connecting Seattle on the lake's west side to Bellevue, Redmond and Kirkland on its east side. Not only is the highway, and particularly the bridge portion across Lake Washington, heavily congested in both directions during peak commute times, studies have shown that demand for travel across the bridge will continue to exceed supply. Therefore, Transportation Demand Management (TDM), land use and transit strategies play an essential part in any improvements to the corridor.

TDM and land use actions have played a significant part in both the Trans-Lake Washington Study (1998-1999) and SR 520 Environmental Impact Statement (EIS) (2001-present). The Trans-Lake Washington Study included the recommendation that interlocal agreement(s) should be developed to implement TDM and land use measures in the Trans-Lake Washington corridors. This recommendation is a key element in the TDM program developed for the SR 520 EIS. The SR 520 EIS also includes a 20-year, \$285 million TDM program as part of all alternatives developed for the EIS analysis. To support decision-making during development of an interlocal agreement and implementation of the SR 520 corridor TDM program, there was a need for more detailed, quantitative information about the effectiveness of TDM and land use strategies in the corridor. Out of this need, the Modeling TDM Effectiveness project was funded by the Federal Transit Administration and WSDOT in 2001 and the Federal Highways Administration in 2002.

Project Structure

This project is made up of two major elements:

- Development of the analytical tool (the TDM Effectiveness Estimation Methodology, or TEEM)
- Application of TEEM to 10 case study areas in the SR 520 corridor

The analytical tool, known as the TDM Effectiveness Estimation Methodology, or TEEM, is highly detailed and can assist decision-makers, planners, or others developing TDM programs or implementation plans in the SR 520 corridor. Alternative packages of TDM strategies can be tested at the neighborhood or subarea level, allowing the user to quickly identify a package of potentially effective strategies for the area. TEEM was designed to be user-friendly and accessible, recognizing that many of its potential users are not necessarily familiar with traditional travel demand modeling.

Characteristics of TEEM

Forecast year is 2030
Focuses on commute trips
Works at the neighborhood/subarea level
Estimates incremental change in travel characteristics
Based on historical rates of effectiveness
Majority of data from King County

The 15 TDM strategies included in TEEM are based on program elements of the TDM Program developed for the SR 520 EIS. Since there is a high percentage of commute trips crossing the SR 520 bridge in both the AM and PM peak periods, the strategies are focused primarily on commuter incentive-based strategies. TEEM can test the following 15 TDM strategies individually and in combination:

1. Vanpooling
2. Alternative Mode Subsidy
3. CTR-Type Programs for Smaller Employers
4. Telecommuting
5. Compressed Work Week
6. Multi-Employer Transportation Management Associations (TMAs)
7. Increased Density near Transit Corridors
8. Increased Mixed-Use Development
9. Increased Infill & Densification
10. Improved Bicycle Access
11. Improved Pedestrian Access
12. Restricted Parking Supply
13. Parking Pricing at Employment Sites
14. Flexpass/Residential Pass
15. Increased Transit Service

TEEM estimates the change in commute travel behavior in the year 2030 that would result from implementation of one or more of the above strategies within a study area and on the SR

520 corridor. The performance measures used in TEEM to evaluate TDM strategy effectiveness are based on the SR 520 TDM Program's primary goals to reduce growth of vehicle miles traveled in the overall SR 520 corridor and to increase person-throughput on the bridge. Five performance measures are used in TEEM, providing a broad perspective on how each strategy affects travel patterns:

- Commute Trip Drive Alone Mode Share
- Daily Commute Vehicle Trips
- Daily Commute Vehicle Miles of Travel (VMT)
- P.M. Peak-Period Commute Vehicle Trips
- P.M. Peak Period Person Throughput on the SR 520 Bridge

The TEEM software works off of existing model outputs, predicting the change from a year 2030 base level of TDM and land use (reflected in baseline mode shares and vehicle trip linkages).

TEEM was set up and calibrated using ten case study areas within the SR 520 corridor. The ten areas were selected to represent a variety of area types, travel patterns and TDM markets. Each of the case study areas can thus be used as a prototype for other similar areas in the corridor that were not selected as case study areas for this project. The study areas, listed below, also served as an illustration of TEEM's applicability:

Seattle

- University District
- South Lake Union
- Wallingford

Redmond

- Downtown Redmond
- Willows Road

Kirkland

- Downtown Kirkland
- Totem Lake

Bellevue

- Downtown Bellevue
- Crossroads

King County

- Redmond Ridge

TEEM is based on reported experiences with TDM and land use strategies, primarily from within King County, the county in which the SR 520 corridor is located. National research was used when local data was limited or not available. The project team relied heavily on

data collected in King County for the state's Commute Trip Reduction (CTR) program. The database is an excellent source of information on TDM effectiveness, providing roughly ten years of history for over 500 employers in King County who employed roughly 120,000 employees in 2001.

Though the purpose of the project was ultimately to provide information directly relevant to the SR 520 corridor, TEEM was developed in a way that could support other similar corridor or sub area analyses in the future within King County and the Central Puget Sound region. Future corridor studies, primarily the I-405 Congestion Relief Program, will offer additional opportunities to use TEEM to evaluate TDM strategies.

The effectiveness factors developed for TEEM can easily be applied to evaluate TDM strategies in other corridors, activity centers, or neighborhoods in King County. The model is structured to use travel activity data from a local model and the regional model for calibration, so any activity center or neighborhood in King County for which local model zones are consistent with (or can aggregate to) PSRC model zones can easily be added into TEEM. Given the availability of data from Pierce, Snohomish, and Kitsap Counties (the other counties in the Central Puget Sound Region), TEEM can be expanded to include other study areas or corridors in the region.

It is also possible to estimate the potential effectiveness for an intermediate year (between now and 2030) by assuming a proportional amount of growth in population, employment and trip ends from the 2000 base and adjusting the baseline data in TEEM accordingly. However, as discussed in the following section, some strategies are better suited than others for achieving short-term effectiveness, and so attempts to test strategies in less than a fifteen or twenty-year time frame should be done with sensitivity to the temporal differences between strategies.

Results

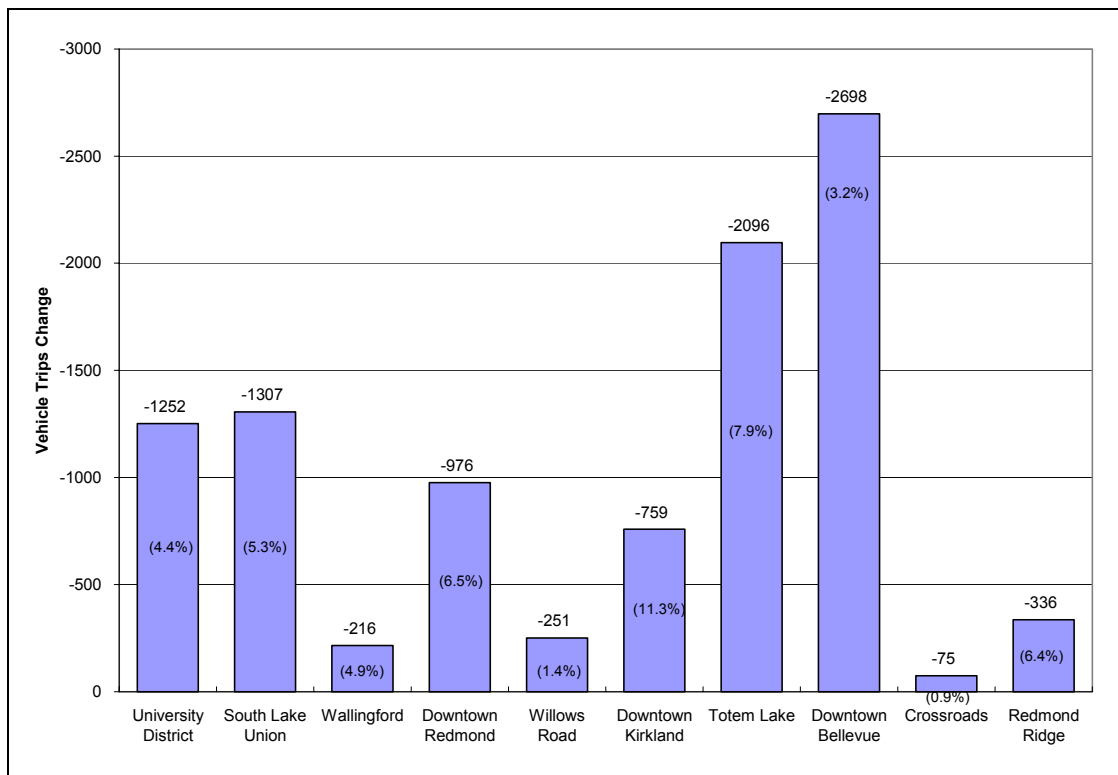
To test TEEM in the ten study areas, five TDM strategies were applied in each area (for a total of 50 strategy applications). Each of the fifteen strategies was tested at least once as indicated in the table below. This allowed the study team to begin examining the effectiveness of individual strategies and how that effectiveness varied across applications.

The testing of TDM strategies in this project was limited by budget to 50 strategy applications, but in future applications of TEEM, it is important to remember to consider that an optimal package of strategies may well include more than five strategies in a study area. It is also important to consider how the various strategies work together. A well-designed package that includes financial incentives, alternative modes, supportive land use and promotion and coordination will have the best chance of meeting corridor goals. In the case of some TDM strategies, particularly parking pricing, corridor-wide consistency may be needed to avoid conflicts or competition between different sub areas or jurisdictions. It is also necessary to consider the time frame necessary to fully implement each strategy. Some, such as the employer-based strategies, will be able to be effective in the short term while others, such as the land use or parking pricing strategies, will require more time for implementation and therefore will require a longer time frame to be effective.

Strategies Tested by Case Study Area

Case Study Area		Vanpooling	Alternative Mode Subsidy	CTR-Type Programs for Smaller Employers	Telecommuting	Compressed Work Week	Multi-Employer TMA	Increased Density Near Transit Corridors	Increased Mixed-Use Development	Increased Infill & Densification	Improved Bicycle Access	Improved Pedestrian Access	Restricted Parking Supply	Parking Pricing at Employment Sites	Flexpass/Residential Pass
Seattle															
1	University District	.	●	●	.	.	.	●	.	.	●	.	.	●	.
2	South Lake Union	.	●	.	.	.	●	.	●	●	.	.	.	.	●
3	Wallingford	.	●	●	.	.	●	.	.	.	●	.	.	.	●
Redmond															
4	Downtown	●	.	.	.	.	.	.	●	.	.	●	●	●	.
5	Willows Road	●	●	.	●	.	.	●	.	.	●	.	.	.	.
Kirkland															
6	Downtown	.	.	.	●	.	●	.	.	.	.	.	●	●	●
7	Totem Lake	●	.	●	.	.	●	.	.	.	.	.	.	●	●
Bellevue															
8	Downtown	.	●	.	.	.	.	●	●	●	.	.	.	●	.
9	Crossroads	.	●	.	.	.	.	●	●	●	.	.	.	.	●
King County (unincorporated areas)															
10	Redmond Ridge	●	●	.	.	●	.	.	.	.	●	.	.	.	●
TOTAL		4	7	3	2	1	4	4	4	3	4	1	2	5	6

Predicted Reductions in Daily Commute Vehicle Trips by Study Area Employees



In addition, the application of TEEM to the ten case study areas suggested that five strategies would be most effective overall:

Parking Pricing at Employment Sites was the most effective strategy overall, and was most effective in study areas where the year 2030 baseline parking price was low or zero and where there were alternative modes available for commuting. Analysis of an additional \$2 to \$3 parking fee indicated that it could produce a reduction in commute trips of up to 9.8% to and from individual study areas where tested.

Increased Infill & Densification entailed reallocating growth from one part of the study area to another in order to create pockets of higher density. This strategy showed potential for significant effectiveness in areas where high growth was expected but planned for fairly even distribution across the study area. TEEM predicted this strategy could result in up to a 4.4% reduction in commute trips to and from individual study areas where tested.

Increased Mixed-Use Development, which redirected future growth in a study area to create a greater mix of residential and retail development around employment sites, also proved to be highly effective. This strategy was most effective when the baseline growth forecast reflected highly segregated uses, and produced a reduction in commute trips of up to 2.8% for individual study areas.

Multi-Employer TMAs demonstrated a potential effectiveness of up to 1.8% reduction in commute trips by study area employees for individual study areas, and was most effective when the study area contained a large number of employees covered by the CTR requirements.

Alternative Mode Subsidy was most effective in those case study areas where the base alternative modes shares (carpooling, vanpooling, and transit) were already fairly high, indicating the viability of alternative modes in that area. The analysis of this strategy indicated a potential effectiveness of up to 1.6% reduction in commute trips for study area employees to and from individual study areas where tested.

Recommendations

TEEM's development demonstrates that TDM's role in major corridor studies can be evaluated using data from regional and national experiences with such strategies. To complete the analysis for the SR 520 corridor, it is recommended that TEEM be used to test the potential effectiveness of additional TDM and land use strategies in each of the case study areas and to test the potential in the remaining employment centers in the corridor.

The results from the testing of strategies in the ten case study areas suggest that the most effective approach will be a combination of strategies that provide:

- Pricing
- Transit & Non-motorized Supportive Land Use
- Promotion/Coordination
- Alternative Mode Options

Such a combination of strategies would work together supportively and could be tested in all of the case study areas. Other areas in the SR 520 corridor that could be evaluated include the following:

Seattle

- Northgate
- Downtown
- First Hill

Kirkland

- Juanita
- Carillon Point

Bellevue

- Factoria
- Bel-Red/Northup
- Eastgate
- Lakemont

Redmond

- Southeast Redmond
- Northeast Redmond
- Grasslawn
- Overlake

Although TEEM represents a significant step forward in modeling TDM strategies, it is a work in progress. The following enhancements could improve TEEM's ability to fully quantify the effectiveness of TDM strategies:

- Revision of the way land use strategies are analyzed to allow testing of strategies on a corridor-wide basis rather than just within a subarea.
- Automation of the process of transferring data from the local and regional models to TEEM when new areas are to be added or new forecast years tested.
- Adding more strategies, such as non-commute strategies
- Expand effectiveness factors beyond historical trends to include market potential from such sources as the regional vanpool market study
- Expanding TEEM's capability so that it can estimate a full corridor program at a corridor level

TEEM's development relied heavily on the rich data provided by the state's Commute Trip Reduction database. Continued use and maintenance of this database could provide a consistent source of information on TDM effectiveness within King County, the Puget Sound region, and statewide. If resources permit, additional effort could be devoted to making sure that data received from the employers are verified and recorded accurately. Consideration might also be given to requesting more detailed employer cost information, which would allow information on cost effectiveness to be incorporated into TEEM.

Finally, it is recommended that a system for monitoring the effectiveness of TDM strategies be designed and implemented to provide information on how well strategies are

working. A monitoring system can be used to refine the strategies by adjusting the way the strategies are being implemented, or to determine whether additional strategies may be needed to meet subarea or corridor-wide goals. The data from the monitoring system may also be useful for refining TEEM over time, providing more information with which to re-estimate local effectiveness factors.

Recommendations Summary

Components of an Effective Corridor TDM Strategy

- *Pricing*
- *Transit & Non-motorized Supportive Land Use*
- *Promotion/Coordination*
- *Alternative Mode Options*

Additional Analysis in SR 520 Corridor

- *Test additional strategies in study areas*
- *Test other employment centers in corridor*

Enhance TEEM

- *Revise analysis method to allow testing of land use strategies on a corridor-wide basis*
- *Automate data transfer process from models*
- *Add more strategies, including non-commute strategies*
- *Expand effectiveness factors to include market potential*
- *Further verify CTR data and add data for other counties in the region*
- *Expand capability of TEEM to estimate a full corridor program at a corridor level*

Establish a TDM Effectiveness Monitoring System for the Region